

Autotransplantation for Central Non-Small- Cell Lung Cancer

in a Patient with Poor Pulmonary Function

Michael J. Reardon, MD
Jon-Cecil M. Walkes, MD
David C. Rice, MD

Lung resection is the standard therapy for non-small-cell lung cancer confined to the lung. The extent of pulmonary resection is dictated by the location and extent of the tumor and the patient's physiologic ability to tolerate resection. We present the case of a patient who had a large non-small-cell tumor of the lung that involved the right main stem bronchus and the adjacent pulmonary artery; poor pulmonary function precluded a pneumonectomy. Right upper and middle sleeve bilobectomy resection was performed, but reconstruction was not possible due to tethering by the intact lower lobe vein. Therefore, the remaining lower lobe was removed, and the lower lobe vein was divided and reimplanted into the upper lobe pulmonary venous stump. Cephalad advancement and autotransplantation of the lower lobe were then accomplished. These procedures allowed enough mobilization for direct bronchial and arterial reconstruction. (Tex Heart Inst J 2004;31:360-2)

Lung cancer occurs in epidemic proportions around the world and continues to increase as the most common cause of solid-tumor cancer death in both men and women in the United States. Small-cell lung cancer is generally managed with nonsurgical treatment, while non-small-cell lung cancer (NSCLC) confined to the lung is best managed with surgical resection. The extent of resection is dictated by the anatomic location and the extent of the tumor, as well as the patient's physiologic ability to withstand the resection. Non-small-cell lung cancer that occurs in a central location may not allow a standard lobectomy for complete excision. Under these circumstances, pneumonectomy or sleeve resection is necessary for complete removal of the tumor. We describe the case of a patient with large right central NSCLC for whom sleeve resection was the only surgical option because poor pulmonary reserve did not allow a complete pneumonectomy.

Key words: Carcinoma, non-small-cell lung/surgery; human; lung neoplasms/surgery; lung transplantation; male; pulmonary arteries/surgery; pulmonary veins/surgery; transplantation, autologous

From: Methodist DeBakey Heart Center (Drs. Reardon and Walkes), and M.D. Anderson Cancer Center (Dr. Rice), Houston, Texas 77030

Address for reprints:
Michael J. Reardon, MD,
6560 Fannin St., #1002,
Houston, TX 77030

E-mail:
mreardon@tmh.tmc.edu

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Case Report

In May 2001, a 58-year-old male smoker was found to have a squamous cell cancer of the right main stem bronchus involving the upper lobe orifice (Fig. 1). A computed tomographic (CT) scan of the chest revealed a central right lung mass, with no liver or adrenal disease and no enlarged mediastinal lymph nodes. The patient was asymptomatic except for a cough and some right chest pain. Pulmonary function tests revealed a 1-second forced expiratory volume (FEV₁) of 1.18 L/min. He was referred by the pulmonary service for resection, but it was believed that he would not be able to tolerate a pneumonectomy. Sleeve resection of the right upper lobe was planned; however, right upper and middle bilobectomy sleeve resection of the bronchus and the associated and involved pulmonary artery was necessary for complete resection. When the need for vascular resection was recognized, intravenous heparin at 1 mg/kg was administered.

After excision, the gap between the proximal and distal airway and artery could not be bridged due to a tethering effect by the intact lower lobe vein (Fig. 2). To enable mobilization of the remaining right lower lobe and the bronchial and arterial segments, the inferior pulmonary vein was divided. Lower lobe excision, cephalad advancement, and autotransplantation allowed direct connection of the bronchus and artery. The lower lobe vein was implanted into the remaining upper lobe pulmonary venous stump (Fig. 3).

The bronchial anastomosis was done first. The membranous portion was attached with a 3-0 polydioxanone surgical (PDS) running suture, and the cartilaginous portion of the bronchus was closed with interrupted 3-0 PDS sutures that were spaced to accommodate the size difference between the proximal and distal bronchus. The pulmonary venous anasto-

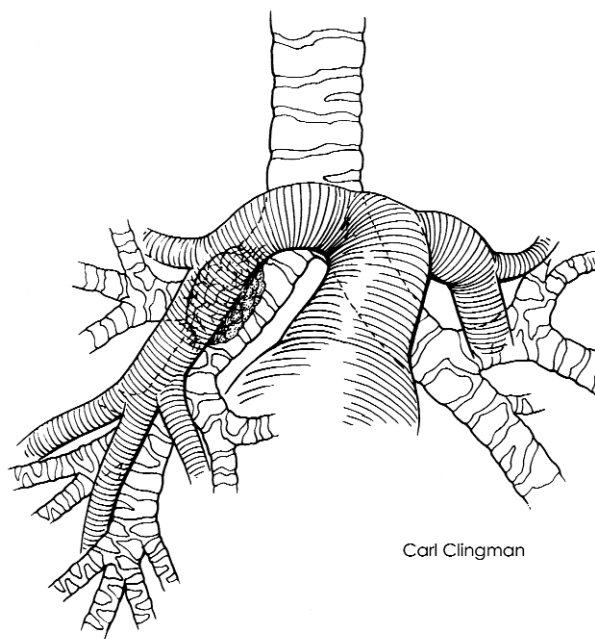


Fig. 1 Tumor location.

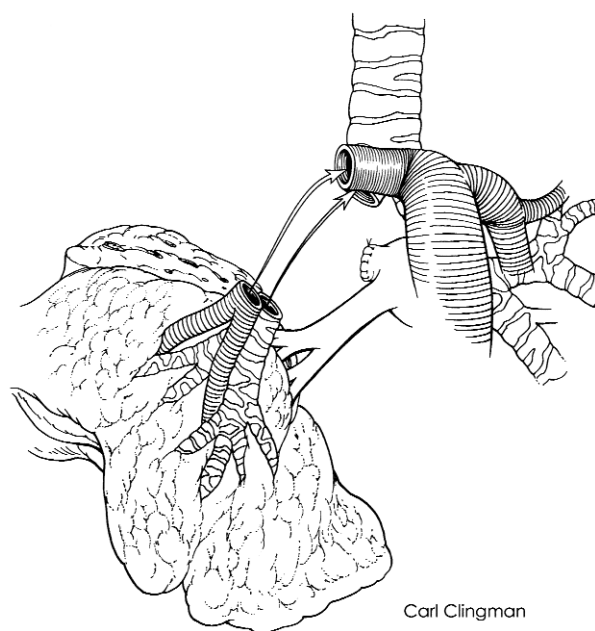


Fig. 2 Right upper and middle sleeve bilobectomy of bronchus and artery.

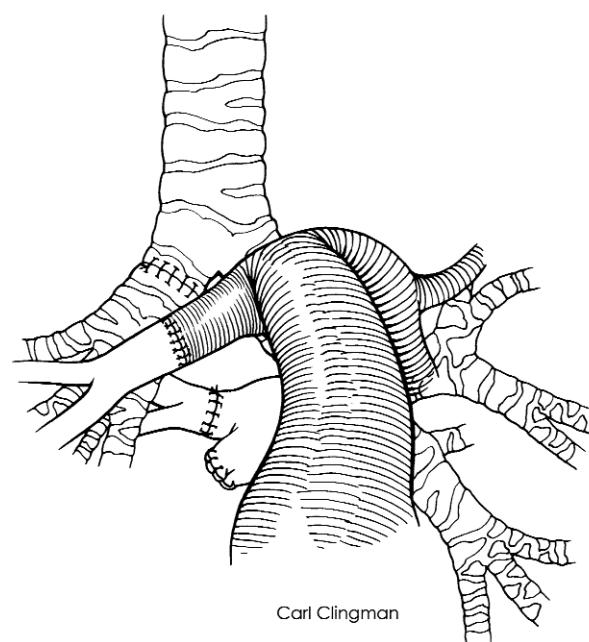


Fig. 3 Completed left lower lobe reimplantation.

mosis was done next, with a running 5-0 polypropylene suture; however, this suture was not tied, to allow future venting. The pulmonary arterial anastomosis was performed last, with a running 5-0 polypropylene suture. The arterial clamps were removed with the venous anastomosis open to remove residual air, and then the venous suture line was tied.

The histopathologic examination revealed a 5-cm tumor within 1 cm of the carina. Six out of 13 N1 nodes were positive, with no positive N2 nodes, making this a stage IIIA tumor. The patient's postoperative course was complicated by pulmonary infiltrate, which could have resulted from pneumonia or from ischemia/reperfusion injury, and by a prolonged air leak that closed spontaneously. The patient was discharged from the hospital on the 28th postoperative day. He subsequently developed distant metastatic disease and died 18 months postoperatively.

Discussion

Lung cancer is the most common cause of cancer death in men and women in the United States.¹ Non-small-cell lung cancer confined to the lung is best treated with pulmonary resection, if possible.² Centrally placed tumors can involve structures that preclude an isolated lobectomy and require a more extended resection. Pneumonectomy can often be performed under these circumstances to enable complete resection; however, pneumonectomy has a higher surgical mortality rate than does lobectomy and

results in a greater loss of functioning lung tissue. If the level of pulmonary reserve precludes a pneumonectomy, as it did in our patient, then sleeve resection of the bronchus and, if necessary, the artery can enable complete resection with preservation of the distal functioning tissue. Sleeve resection has acceptable mortality and survival rates, similar to those found after lobectomy.³

In our patient, the extensive bilobectomy sleeve resection of the bronchus and artery left a gap that was too large to bridge while the lower lobe was still tethered by the intact lower lobe vein. This complicated maneuver was not initially contemplated; therefore, no measures for lung preservation to prevent ischemia/reperfusion injury were performed.

Total excision of lower lobe tissue with reimplantation at a more cephalad level has been reported in both the German⁴ and the Chinese⁵ medical literature, but to our knowledge it has not been reported in the U.S. literature. Single-lung flushing with lung preservation solution, although not done in our patient, may help prevent ischemia/reperfusion injury in the future.

We conclude that complete excision of the lower lobe with autotransplantation to a more cephalad level is technically feasible and can allow extensive sleeve resection in patients who have central non-small-cell lung cancer and poor pulmonary reserve.

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